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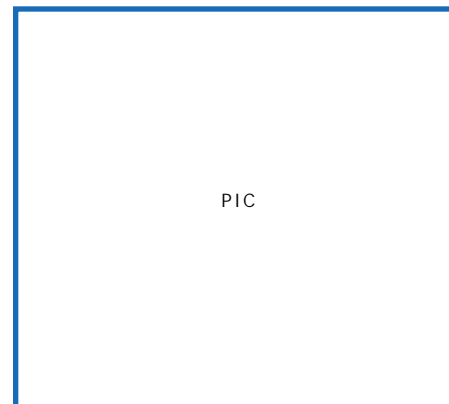
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## Exploring Different Options Results in Cost Savings for Aluma<sup>x</sup>, Inc.

Sometimes saving energy is almost as simple as flipping a switch. For an Aluma<sup>x</sup>, Inc., aluminum processing plant in South Carolina, shutting off one of four fans in each pot-line, fume-collection system netted an electrical energy savings of more than \$103,000 annually.

The Mount Holly Plant in Berkeley County, South Carolina, a Motor Challenge Showcase Demonstration site, produces 200,000 tons of aluminum annually. This plant processes alumina (aluminum oxide) into custom-alloyed ingots and billets for fabrication into consumer products. To do so, this plant consumes 300 megawatts of electricity continuously, representing a weekly utility bill of \$1.7 million.

As staggering as this seems, the Mount Holly Facility is a model of efficiency, consuming only 6.1 kWh per pound of aluminum produced, compared to an industry average of 8 kWh per pound. Still, the employees at Mount Holly demanded more from themselves and their equip-



*Aerial view of Aluma<sup>x</sup> plant.*

ment. "Our corporate policy calls for us to look for opportunities to save energy and improve our environmental awareness. We are a part of this community too. The smarter we run our plant, the better it is for the company's bottom line, local community, and environment as a whole," said Cecil Pulley of Aluma<sup>x</sup>.

With that in mind, Aluma<sup>x</sup> teamed with Jacobs-Sirrinc Engineers to sponsor a  
*(continued on page 4)*

## 3M Becomes First Motor Challenge Excellence Partner!

Consistent with corporate goals of reducing energy consumption, 3M became Motor Challenge's first Excellence Partner. Motor Challenge is happy to welcome them and looks forward to working together. As an Excellence Partner, 3M commits to implement a comprehensive motor systems management initiative throughout its corporation, realizing that continual improvement of motor systems management and best practices result in cost savings, improved production, and emission reductions. 3M's Tape Manufacturing Plant at the East Side site in St. Paul, Minnesota, is the initial site for carrying out the corporate Motor Systems Management Plan, which includes installing

energy-efficient motors and motor controls, and implementing motor system optimization and preventative and predictive maintenance programs. "We are looking forward to participating in this program. The Motor Challenge Excellence Partnership will be a useful tool to help us achieve our corporate goal of attaining greater energy efficiency in our operations," states Charles E. Kiester, Senior Vice President of Engineering, Quality and Manufacturing Services at 3M.

For more information on Motor Challenge's Excellence Partnership opportunities, consult the Web site at [www.motor.doe.gov](http://www.motor.doe.gov) or contact Chuck Procner, Motor Challenge, at (913) 831-2010.

## Allied Partners Growing in Numbers and Activities



The Energy Savings  
Network—Plug Into It

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Allied Partners, now numbering more than 125, are continuing to reach out to and educate their industrial customers on

the benefits of energy-efficient motor systems. How are they reaching customers? With their expertise and the use of Motor Challenge materials. Allied Partners have distributed 700 copies of *MotorMaster+* (*MM+*) software to their customers in just the last year. In addition, Allied Partners have conducted or participated in over 50 events such as trade shows, workshops, or seminars, in which they displayed and used Motor Challenge materials. Read on for specific examples of how some Allied Partners are reaching their customers.

Carolina Power and Light in Raleigh, North Carolina, held a *MM+* training workshop last December for about 15 energy sales engineers along with one end user from Swift Textiles Co. Swift has several facilities with as many as 1,000 motors, which use up to 15 megawatts of energy for conveyer and spinning processes. Carolina Power and Light also has distributed *MM+* to seven other textile companies.

Electro-Mec, Inc., out of Indiana, Pennsylvania, successfully used *MM+* for their customers, PPG Industries and Armstrong Cement, to assess motor system upgrades. Electro-Mec input 50 motors at a PPG flat glass facility into *MM+* and determined that PPG could save \$6,300 annually if they replaced these motors with new premium, energy-efficient ones, with about a 1-year payback. As a result, PPG recently made the decision to replace all 50 motors!

Kaman Industrial Technologies (national contact point in Tonawanda, New York) has been active in the continuing promotion of a complete motor systems management program, which includes the use of training modules developed for the Motor Challenge Program,

*MM+*, and the *Horsepower Brochure*. In addition, Account Manager Bill Orthwein provided *MM+* training to Kaman's Electrical Applications Engineers. Kaman is currently working with a number of customers throughout the country in the efficient motor systems area.

North Carolina State University is using Motor Challenge materials to augment their energy outreach efforts across the state. "The *MotorMaster+* software and literature provided through the program have been valuable additions to our motor workshops," explains Dan Mull with the Industrial Extension Service, North Carolina State University. "The material and software enable customers to readily evaluate their various motor options," he adds. In addition to using Motor Challenge materials in workshops, they demonstrate *MM+* in their Energy Management Diploma Program. The software serves as the university's primary analysis tool in the motor energy surveys they perform.

In February, Motor Challenge Account Manager Bill Orthwein, on behalf of Reading Electric, conducted a training session on the uses and benefits of *MM+* to customer service personnel and three end

users. Reading Electric, located in Pennsylvania, uses *MM+* as a value added service to their customers. They use the software to add energy savings and payback calculations for target customers. Reading will use *MM+* and the Motor Basics Training Module at quarterly technical meetings for members and vendors.

The University of Alabama in Huntsville, under contract to Sane Engineering Associates, provided a motor audit using *MM+* for the Scott Air Force Base hospital in East St. Louis, Illinois. A total of 26 HVAC motors, between 5 and 40 horsepower, were entered into *MM+*. It was determined that this hospital would save 55,000 kWh of energy annually if they replaced these motors with premium, efficient ones.

*If your organization works with industry, you too might be interested in learning more about how Allied Partners are using Motor Challenge materials to provide increased information and support to their customers. Call the Motor Challenge Hotline at (800) 862-2086 for information on becoming an Allied Partner.*

## Alliance for Industrial Excellence

Are you confused about which programs within DOE's Office of Industrial Technologies (OIT) suit your immediate energy efficiency and technology needs and how to access them? If so, help is on the way with OIT's new Alliance for Industrial Excellence. The Alliance is a streamlined, customer delivery system and access tool that provides individuals and companies with a simplified entry to the OIT resources that best meet their needs. The Alliance integrates five existing OIT programs—Climate Wise, Industrial Assessment Centers, Inventions and Innovation, Motor Challenge, and NICE<sup>3</sup>—and introduces a new technology-focused area to the group, the Steam Partnership. These programs help industry adopt energy-efficient technologies that result in improved productivity, cost savings, and enhanced environmental quality.

The Alliance has as key customers those companies in the seven materials and process industries that make up OIT's Industries of the Future initiative (see related article on page 4), but also serves the rest of the manufacturing sector.

How does it work? Alliance staff will work with you to determine what OIT resources and programs are best for you and your company. They will also direct you to the right contacts within OIT, DOE, and other Federal agencies. For more information, you may contact any of the following three Motor Challenge Program representatives on the Alliance management team: Paul Scheihing, Alliance Team Leader, (202) 586-7234; Julia Oliver, Alliance Communications Lead, (510) 637-1952; and Chris Cockrill, (816) 861-2133.

## Industry Partner Profile: Hydraulic Institute

*This profile is the second in a series highlighting Motor Challenge industry partnerships. Through industry partnerships, Motor Challenge is cooperatively developing new educational products, materials, and services that focus on motor-driven equipment such as pumps, fans and blowers, and air compressors. This highly leveraged activity draws on technical strengths of trade associations representing original equipment manufacturers (OEMs), along with related service organizations. Industry partnerships seek to build and strengthen networks of relationships among OEM trade associations, industrial end users, and energy providers to create new program information and materials.*

The Hydraulic Institute (HI) is a national trade association representing about 70 U.S. pump manufacturers. HI provides product standards for the pumping industry and provides a forum for the exchange of industry information. A new strategic plan called Vision 2000 captures HI objectives

for the future, which include playing a leading role in the development and establishment of international standards and providing new and additional educational opportunities for engineering contractors and users.

HI is known for its 13 ANSI-approved standards on pumps, including standards on test procedures. The institute is developing seven new standards for publication in 1997 and 1998 and is working on updates that will become the 1999 Edition of HI Pump Standards. The 1994 Edition of HI Pump Standards included a new section on "Efficiency Prediction Method for Centrifugal Pumps."

The Hydraulic Institute is a charter Motor Challenge Partner, joining the program at its inception in 1993. Cooperative projects between the Motor Challenge Program and HI include the following:

- Coauthorship of an article on efficient pumping systems, published in the August 1996 issue of *Chemical Processing* magazine.

- Cosponsorship of a series of five "Performance Optimization" seminars in the fall of 1996 for the municipal water/wastewater industry.
- Development of a video-based education program entitled *"Energy Reduction in Pumps and Pumping Systems."* (Please see the Guest Column in this issue for further information about this project.) Motor Challenge and HI will be working together to sponsor a series of national workshops on the newly-released video.

This video-based education on pumping systems is one of many motor system-related educational products developed by Motor Challenge participants and available to Motor Challenge Partners.

For more information, call Vestal Tutterow, Motor Challenge Program, Lawrence Berkeley National Laboratory, at (202) 484-0880 or send e-mail to [vctutterow@lbl.gov](mailto:vctutterow@lbl.gov).



### TECH TIP

*Cube Law? Yeah, BUT...*

*How often have you heard "Reduce speed to half, and power requirement drops to an eighth." The familiar "cube law" says that pumps and fans consume power in proportion to the cube of speed, leading energy efficiency advocates to promote speed reduction measures. But, does the cube law always apply? Not always. Here are some situations in which applying the cube law would overstate dollar savings.*

- *Where there is significant static or working head—This occurs when a pump is lifting fluid to a higher elevation, discharging into a fixed pressure reservoir, or serving a working load.*
- *Where a fixed volume of fluid must be delivered—A faster pump finishes earlier, and then shuts off. Technically the cube*

*law pertains, but the specific energy to move a fixed volume relates more closely to the square than to the cube of speed.*

- *Where pump and motor efficiencies fluctuate—When using variable-frequency drives, speed reductions dramatically reduce discharge pressure, which can decrease pump efficiency. Additionally, below about 25% load, motor efficiency drops rapidly.*
- *Where pumps in parallel feed a single system—If one pump runs a little faster, it reduces the average number of pumps running at any given time. The net effect may even reduce costs.*
- *Where system capacity is marginal—Energy costs may follow the cube law, but a failure to attain target flows can result in costly production losses.*
- *Where motor efficiency improvements overshadow the speed issue—"Conventional wisdom" warns against repowering*

*pumps with energy-efficient motors.*

*However, some energy-efficient motors are marginally faster than their standard counterparts, but dramatically more efficient. Others are actually slower than many standard motors. MotorMaster+ weighs both speed and efficiency to identify the motor with the fastest payback.*

*If your situation matches any of these, your costs might relate to only the square of pump speed, or even be insensitive to speed. Use MotorMaster+ to create custom load types, specifying the exponent that relates load to speed. The message here is not to throw out the cube law, but go beyond it. It is a rule of thumb. System specific analysis is always better than a rule of thumb. For more information, contact the Motor Challenge Information Clearinghouse at (800) 862-2086.*

## THE MOTOR CHALLENGE REGIONAL REPRESENTATIVES

The Motor Challenge Program has six regional representatives throughout the United States who support the program and its Partners. These representatives often coordinate regional and local Motor Challenge workshops and spearhead local outreach efforts. Also, most of these representatives are highly aware of other federal and state energy initiatives within their area that can help private sector companies leverage their energy dollars.

In the next few issues, *Turning Point* will profile different Motor Challenge regional representatives and tell you how to reach the representative in your area.



Sharon Gill is the Motor Challenge regional representative at the DOE Chicago Support Office. This office supports DOE activities in Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, and Wisconsin. Sharon is also a project manager for DOE, within the Office of Energy Efficiency and Renewable Energy. In support of Motor Challenge, Sharon has attended MotorMaster+ workshops, organized a Performance Optimization Workshop, promoted Motor Challenge at area trade shows, visited several manufacturing plants, and obtained a board position with the Midwest Motor Systems Consortium. She was recently awarded the "1996 Energy Manager of the Year" by the local chapter of the Association of Energy Engineers. Sharon Gill can be contacted by phone at (312) 886-8573, by e-mail at [sharon.gill@hq.doe.gov](mailto:sharon.gill@hq.doe.gov), or by mail at U.S. DOE, Chicago Support Office, 1 S. Wacker Drive, Suite 2380, Chicago, IL 60606.



Tim Eastling is the Motor Challenge regional representative in DOE's Atlanta Support Office, which services Alabama, Arkansas, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee, as well as Puerto Rico and the Virgin Islands. Tim is a 22-year veteran with DOE and has established many industrial and energy contacts within the region. His personal network of contacts has proved invaluable as the lead region program manager to Motor Challenge and other DOE programs including Climate Wise and NICE<sup>3</sup>. Tim has supported many Motor Challenge events and workshops within his region; he recruited about 36% of the sites and three state networks for the May 1995 National Motor Challenge Teleconference. Tim has made numerous presentations on behalf of the program at industrial and energy workshops. He has conducted several site visits to local manufacturing plants and is planning to host an industrial conference in the spring. He has also helped to recruit several Allied Partners and a number of Motor Challenge Partners. Tim, a Certified Energy Manager, can be reached by phone at (404) 347-7141, by e-mail at [tim.eastling@hq.doe.gov](mailto:tim.eastling@hq.doe.gov), or by mail at U.S. DOE, Atlanta Support Office, 730 Peachtree Street NE, Suite 876, Atlanta, GA 30308.

## Cost Savings for Alumax, Inc.

*continued from page 1*

Showcase Demonstration project at the Mount Holly plant. The goal was to optimize the operations of its four pot-line, fume-collection systems. Each system was originally designed to operate with four fans in parallel to remove a total of 360,000 cubic feet per minute (cfm) of air at an operating pressure of 20 inches water gauge (in.wg.). From over 10 years operating experience, Alumax determined that 325,000 cfm at approximately 14 in.wg. was sufficient.

From this determination, engineers from Alumax and Jacobs-Sirrine set out to discover which operating method would best match fan capacity to system demand. The Showcase Demonstration team considered the cost to implement variable-speed drives but decided that simply switching one fan off and regulating the flow from the remaining three fans with variable-inlet vanes (VIVs) was the best solution.

Operation of three fans using VIV control for each of the four fume-collection systems has shaved 12% off the plant's auxiliary electricity consumption.

"Motor Challenge saved us a lot of money by helping us explore other ways to improve our processes. By staying with what we had and simply changing the way we operate, we avoided spending \$850,000 to purchase variable-speed drives to improve our efficiency. By simply switching off one fan, we are saving \$15,000 more than we would have with the variable-speed drives," adds Cecil.

## Putting the Customer First

A close working relationship with industry, professional societies, and similar groups is a DOE Office of Industrial Technologies (OIT) tradition. However, to further strengthen its bonds with industrial customers, OIT recently undertook a major initiative called "Industries of the Future." Industries of the Future "puts the customer first."

In the Industries of the Future process, OIT plays a unique role. OIT encourages collaboration among companies in the most energy intensive industries and facili-

tates the development of the industry's strategic vision of its desired future and the technology roadmap to achieve the vision. This process enables each industry to identify and prioritize its collective technology needs. The identification of the critical technology needs of industry, in turn, enables OIT and other Government R&D providers to focus their limited resources in the most important industrial areas and promotes leveraging of scarce public and private sector R&D resources.

OIT's core strategy focuses on seven basic industries. These industries—commonly referred to as the materials and process industries—include the chemicals, petroleum refining, forest products, steel, aluminum, metalcasting, and glass industries.

For more information about Industries of the Future, call the Energy Efficiency and Renewable Energy Clearinghouse (EREC) at 1-800-DOE-EREC. Or check out OIT's home page at [www.OIT.doe.gov](http://www.OIT.doe.gov).





## The Guest Column

*The Guest Column is a new Turning Point feature that will spotlight different authors*

*from various organizations. The articles presented provide technical news of interest to users of motor systems.*

Pump System Design and Application  
Key to Energy Reduction  
by Robert Asdal, Executive Director,  
Hydraulic Institute (HI)



Robert Asdal

Studies conducted by DOE show that pumps used in applications such as power plants, water supply, irrigation, and waste removal among

others, account for 5% of all power consumed annually in the United States. This figure is significant when you consider that virtually all industrial production facilities use pumps in their manufacturing processes. In the vast majority of applications, pumps are driven by electric motors, with internal combustion engines and steam turbines used to a lesser extent.

Industrial pumps have reached a stage in their development where the efficiency with which they convert mechanical power into hydraulic power is quite high. In some applications, pump designs can achieve over 90% efficiency when operated at their design capacity. To achieve further energy reduction and savings of up to 20%, we must look at the entire system design and application. In most cases, it costs more to operate a pump for one year than it does to buy the original pump. An average 20% reduction in operating costs can pay for the cost of a pump in a little over a year's time, depending on the pump's annual operating hours.

With that said, there are numerous opportunities for savings to be explored.

Here are a few considerations for energy savings:

- Design systems with lower capacity and total head requirements. Do not assume these requirements are fixed.
- Avoid allowing for excessive margin of error in capacity and/or total head. It typically will be less expensive to add pumping capacity later if requirements increase.
- Despite the tendency to emphasize initial cost, you will save in the long run by selecting the most efficient pump type and size at the onset.
- Use variable-speed drives to avoid losses from throttle valves and bypass lines, except when the system is designed with high static heads. In such instances, extra concern must be shown when calculating the savings, since the pump affinity laws cannot be used without regard to the change of pump (and motor) efficiency along the system curve. Take care to ensure that the operating point of the pumps remains within the allowable/recommended limits specified by the pump manufacturer.
- Use two or more smaller pumps instead of one larger pump so that excess pump capacity can be turned off.
- Use pumps operating as turbines to recover pressure energy that would otherwise be wasted.
- Maintain pumps and all system components in virtually new condition to avoid efficiency loss.

While to some these considerations may seem obvious, there remains a void in pump education throughout the industry. Results of a recent focus group of engineers, designers, manufacturers, consultants, and executives, by HI, stressed the importance of pump education because it "is not a subject that is covered in engineering school."

Based on this feedback, HI in cooperation with DOE has developed the first in a series of videos, specifically addressing the fundamentals of pumps and a systems approach to pump technology. The first of the educational videos entitled, "Energy Reduction in Pumps and Pumping

Systems," is being released with student workbooks and an instructor's manual. The hour-long video education program may be used as self-guided instruction or in an instructor-led, 4- to 6-hour training session. Each of the learning modules in the video and student workbooks provides greater detail on the tips mentioned above, including actual footage of sites viewed as energy savings showcases. Additionally, the video education program can be used as a complete self-study package. It is available for sale from the Hydraulic Institute. In addition, roll-out of the video education program will include full-day seminars given by HI in cooperation with DOE, major end users, and other associations.

Because pumping represents one of the best opportunities for energy conservation within industry today, we have an obligation to explore any and all avenues leading to increased efficiency. Advanced intelligent monitoring systems, computer software for analysis, and continuing education, such as this new video program, will enable us to do just that.

*The Hydraulic Institute is an 80-year-old, national, not-for-profit trade association of 70 pump manufacturers. It is also one of the first 30 charter Partners in the DOE's Motor Challenge Program. The Hydraulic Institute is perhaps best known for pump standards. All HI standards are approved by ANSI (American National Standards Institute).*

*To order "Energy Reduction in Pumps & Pumping Systems," call (888) 786-7744, toll-free or (201) 267-7772. See special insert for additional ordering information and an order form on the video.*

*For more information on HI standards or other services relating to pump education, contact the Hydraulic Institute at (201) 267-7772.*



## Coming Events

May 13-14	Motor Challenge Industry Partnership conference, Chicago, IL; call (800) 862-2086
May 15-16	Motor Systems Workshop with MM+ Demonstration, sponsored by the Ohio Department of Development and Centerior Energy, Cleveland, OH (15th) and Toledo, OH (16th). Contact Manny Anunike (614) 466-6797, Charles Schwartz (216) 520-9539, or Pam Brown (216) 520-9547
May 21	Northwest Plant Engineering and Maintenance Show, Portland, OR; call (510) 354-3131
May 21-22	Motor Systems Management Workshop and MM+ hands-on training, sponsored by Bonneville Power Administration, Portland, OR. Contact Sheila Morton (503) 230-5991 or e-mail to sdmorton@bpa.gov
May 21-23	National Petroleum Refiners Association, New Orleans, LA; call (202) 457-0480
June 16-20	IEEE Industry Application's Society, Pulp and Paper Committee Annual Meeting, Cincinnati, OH; call (513) 841-3197
June 24-26	Interflow Expo, International Expo and Conference for Flow Technology, Rosemont, IL; call (203) 840-5618
June 26-27	The National Business Energy Forum, New Orleans, LA; call (770) 279-4386
July 8-11	ACEEE Summer Study on Energy Efficiency in Industry, Saratoga Springs, NY; call (202) 429-8873



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### INFORMATION CLEARINGHOUSE

*Do you have questions about using energy-efficient electric motor systems? Call the Motor Challenge Information Clearinghouse for answers, Monday through Friday 9:00 a.m. to 8:00 p.m. (EST).*

**HOTLINE: (800) 862-2086**

*Fax: (360) 586-8303, or access our homepage at [www.motor.doe.gov](http://www.motor.doe.gov)*

# TURNING POINT



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